STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

Stevens T. Mason Building, P.O. Box 30028, Lansing, MI 48909
ROLAND HARMES, Director

January 5, 1994

Ms. Leah Evison (HSRW-6J)
Remedial Project Manager
US EPA, Region 5
77 West Jackson Blvd
Chicago, IL 60604

Dear Ms Evison:

Subject: Albion-Sheridan Township Landfill Superfund Site, Calhoun County, Michigan.

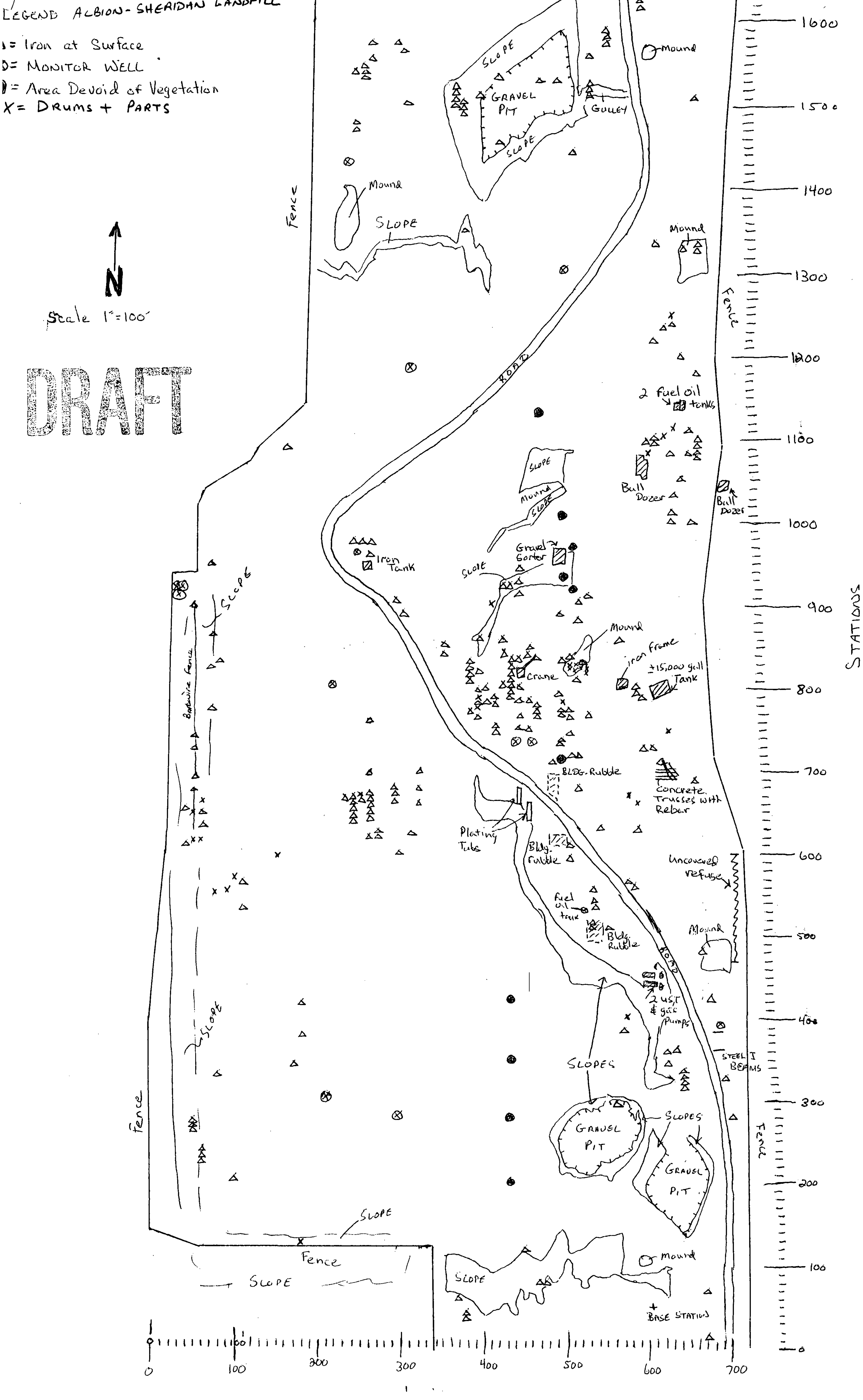
Please accept this letter as the transmittal document for the maps and other written documents you will receive today via overnight delivery. During the last minute rush to prepare the maps, etc. for the overnight packaging, I forgot to include this cover letter. I apologize for any confusion.

If you have any questions, feel free to contact me.

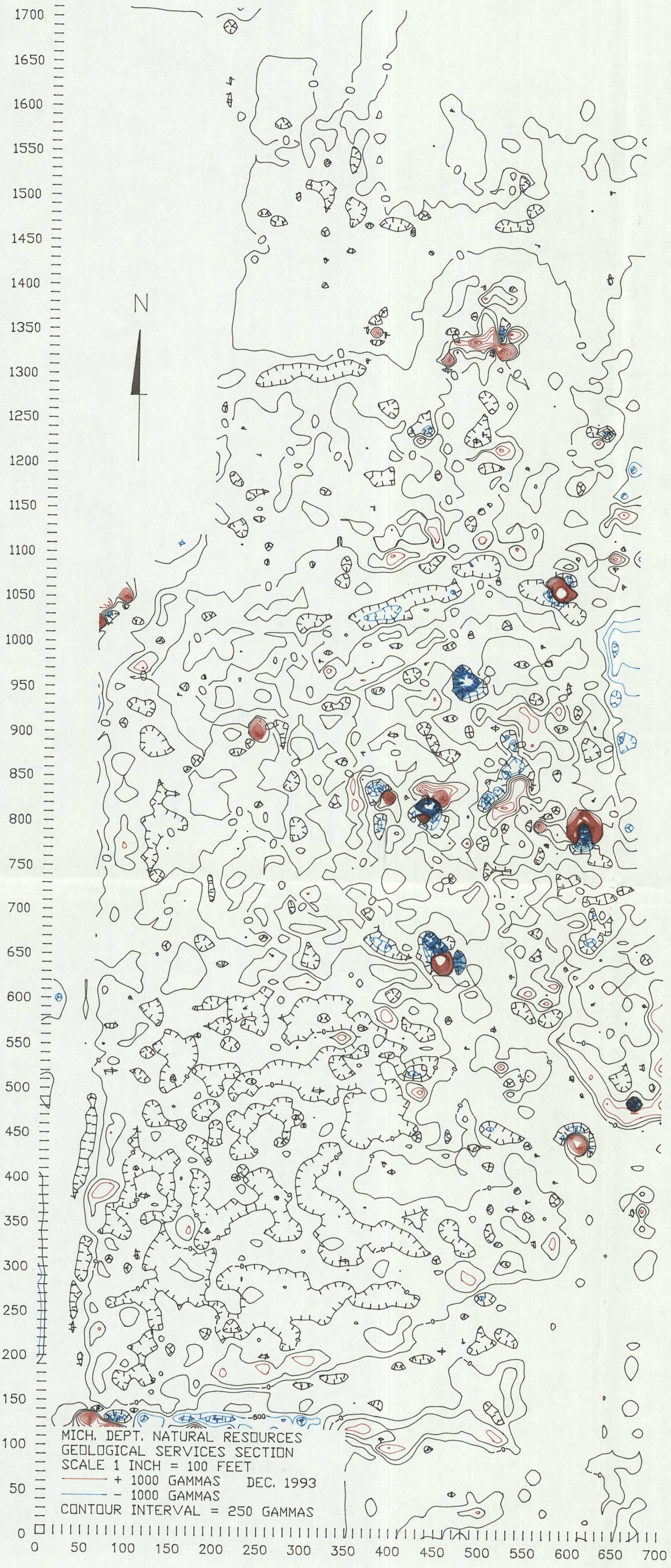
Sincerely,
Gene L. Hall

Gene L. Hall
Superfund Section
Environmental Response Division
517-373-6808

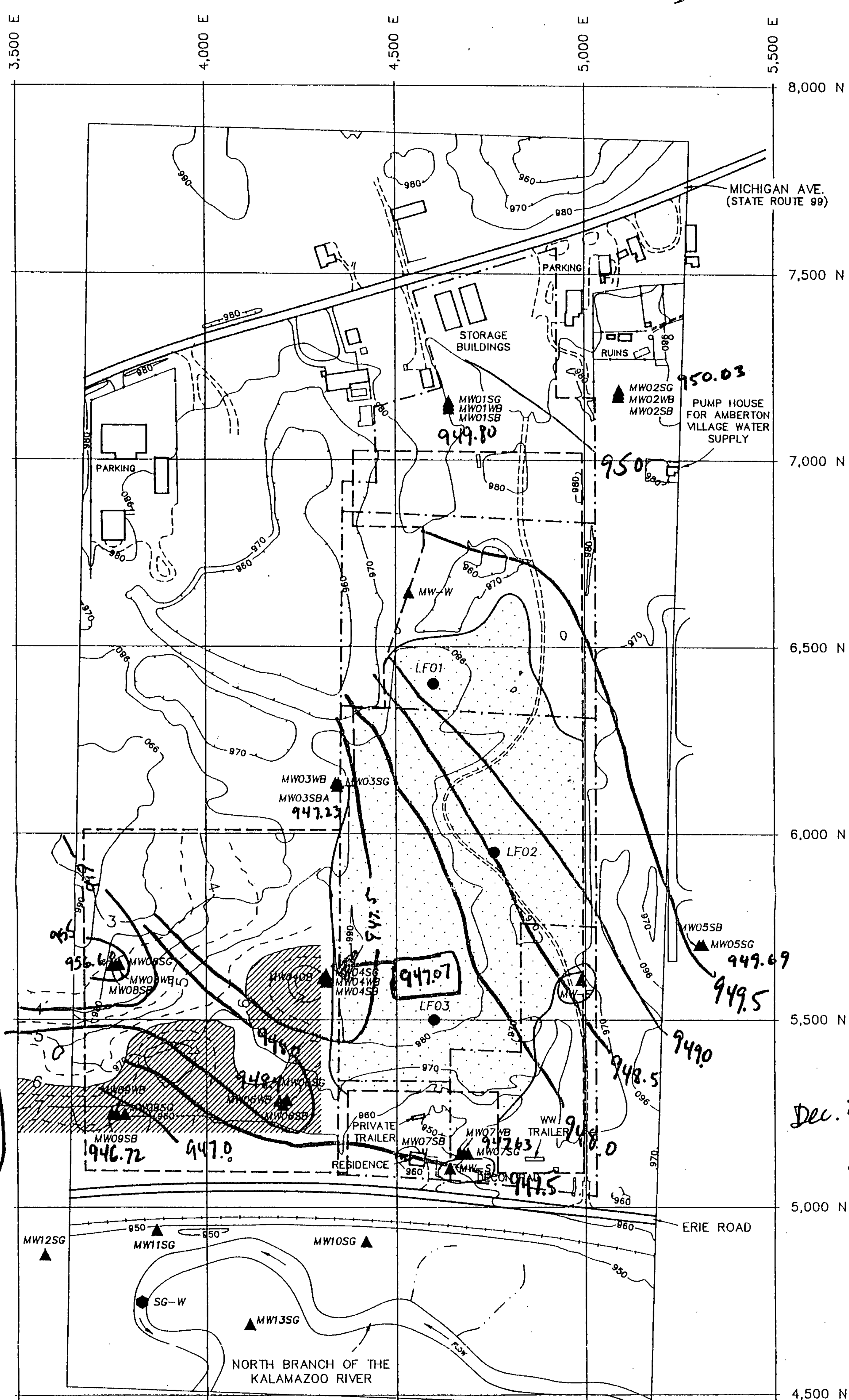
cc: Ms. Liz Bartz, WWES
Albion-Sheridan file (H2)


Legend Albion-Sheridan Landfill
△ = Iron at Surface
⊗ = Monitor Well
● = Area Devoid of Vegetation
X = Drums + Parts
N
Scale 1" = 100'
DRAFT
Fence
Mound
Slope
Gravel Pit
Gulley
Road
2 fuel oil tanks
Bull Dozer
Gravel Sorter
Iron Tank
Barbwire Fence
Crane
Iron Frame
±15,000 gall Tank
Bldg. Rubble
Concrete Trusses with Rebar
Plating Tubs
Uncovered refuse
Fuel oil tank
2 UST & gas pumps
Slopes
Steel I Beams
Base Station
Stations
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600

ALBION–SHERIDAN GRADIENT MAG



SWL Attachment #3 Glacial (water table Wells) Dec 22, 92



Note
Elevation of GW at MW 8 is 956
Groundsurface elevation at MW9 is 956

Dec. 22. 1992
glacial Statics

LEGEND

- APPROXIMATE LANDFILL BOUNDARY (DASHED PORTIONS INDICATE THE SURVEY GRID BOUNDARY)
- PROPERTY BOUNDARY
- 970 — TOPOGRAPHIC CONTOUR (10ft. interval)
- UNPAVED ROAD
- INTERMITTENT STREAM
- RAILROAD TRACK
- MONITORING WELL LOCATION
- LEACHATE WELL LOCATION
- STAFF GUAGE LOCATION
- LIMITS OF AREA SURVEYED WITH EM-34
- CONTOURED EM34 CONDUCTIVITY
- DEEP EM VALUES EXCEEDING 6 mmhos/m

$\boxed{947.07}$ Static Water level at MW04 in the well screened just below the water table.

DRAFT

0 100 300 600
SCALE IN FEET

20M-H
LVP060493

FIGURE 14A
CONTOUR MAP OF
EM34 QUADRATURE PHASE
CONDUCTIVITY DATA
(20M HORIZONTAL)

ALBION-SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN
JUNE, 1993 04011.03

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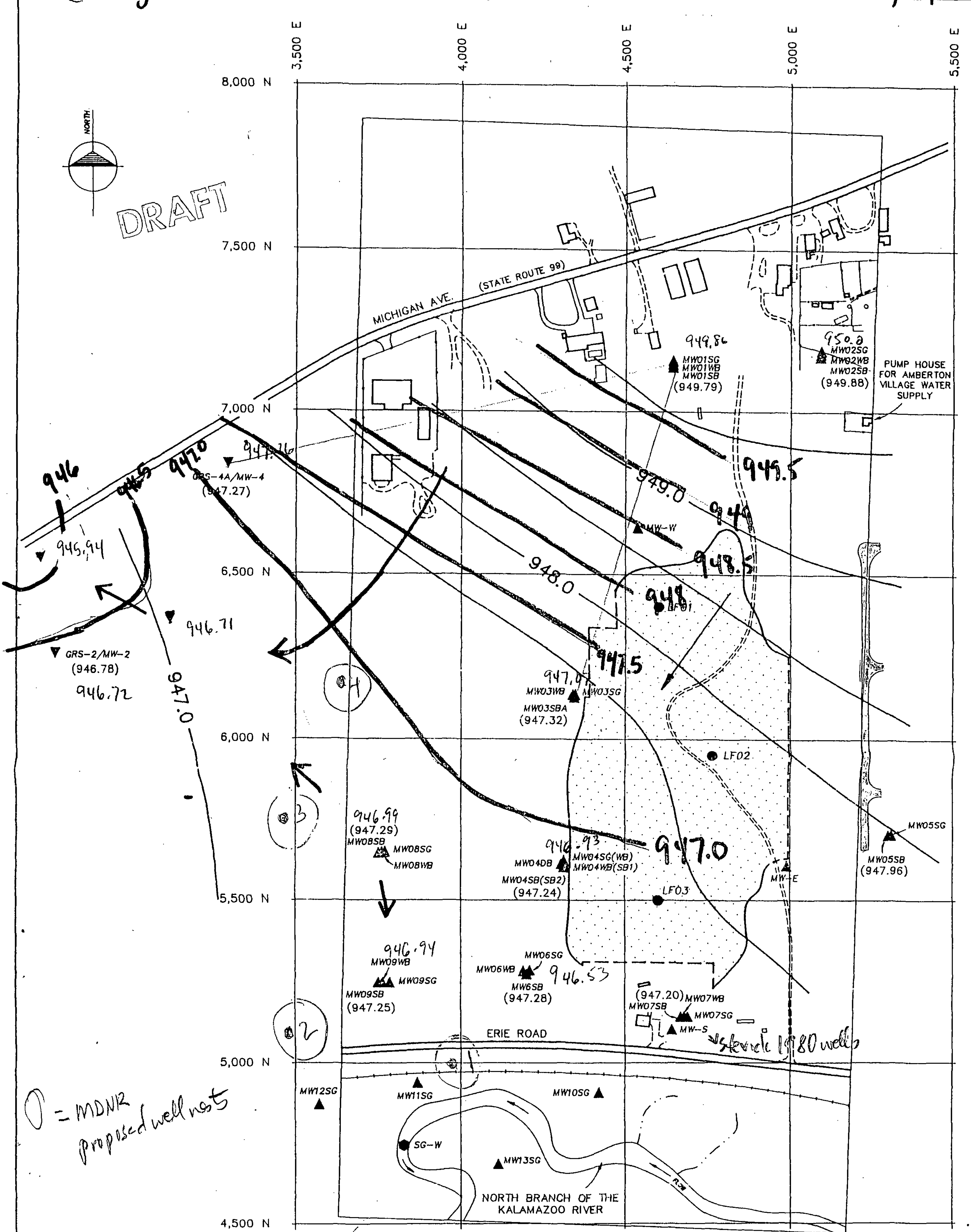
Attachment #5 of SWL Shallow Bed Rock 12/13/93



LEGEND

- APPROXIMATE LANDFILL BOUNDARY (DASHED PORTIONS INDICATE THE SURVEY GRID BOUNDARY)
- UNPAVED ROAD
- INTERMITTENT STREAM
- RAILROAD TRACK
- MONITORING WELL LOCATION
- LEACHATE WELL LOCATION
- GRS WELL LOCATION
- STAFF GUAGE LOCATION
- 948.0 — GROUND WATER CONTOUR
- (947.27) — GROUND WATER ELEVATION
- DIRECTION OF GROUND WATER FLOW

WATER LEVELS WERE MEASURED IN SB-SERIES WELLS ON MARCH 8, 1993.

0 100 300 600

SCALE IN FEET

SBED-MAR
LVP042293

FIGURE 46

SHALLOW BEDROCK GROUND WATER FLOW MAP (MARCH 8, 1993)

ALBION-SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN

APRIL, 1993 04011.03

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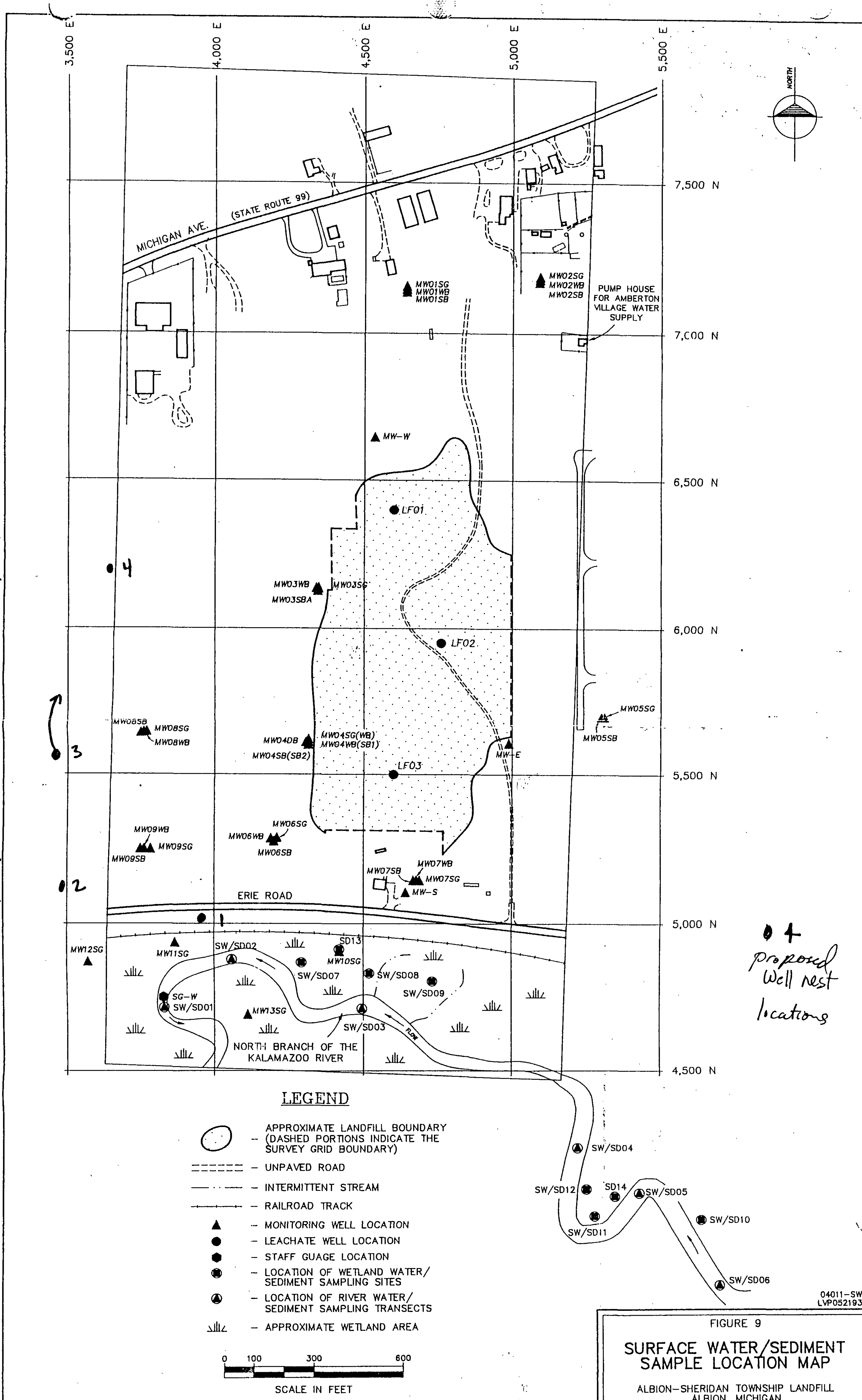

FIGURE 9

SURFACE WATER/SEDIMENT SAMPLE LOCATION MAP

ALBION-SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN

MAY, 1993 04011.03

WW Engineering & Science

Gene: 517 373-4821

FAX

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Date: 1-6-1994

Leadsheet + 3 Page(s)

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Company: USEPA Division:

FAX Number: 312-353-5541 Phone Number: 312-886 4696

Name of Sender: Lic Bartz

Division: ES

Project No.: 04011.03

FAX Number 616/942-6499

Subject: Magnetometry 101

Comments: These cartoons depict what's fundamentally in error with the MDNR's selected locations. This is just FYI - if you're interested. I left you a voice mail too.

Initials of FAX Operator: ______ Date: ______ Time: ______

nent moment and any very large or extended shape of the object may create complexity of anomaly shape in the 'near field' of an object. (NOTE: the magnetometer signal may also disappear which itself indicates a high gradient and therefore the near presence of an object.)

It may be important during this detailed mapping phase of a search to be able to recognize an anomaly of interest quickly so as to minimize the efforts involved in this localized remapping of what appears to be an anomaly of interest, but after the fact turns out to be something *much too small, much too deep, or much too shallow* had one been able to recognize certain anomaly characteristics. Approximate depth estimation is useful when also used, in turn, for estimation of the size of the object according to the order of magnitude methods described in the following. (See Chapter VIII for accurate depth determination using readings at two sensor positions.)

Special Search Topics

Iron and Steel

The maximum anomaly amplitude for a variety of objects can be estimated given their size, weight and description by using the formulae presented in Chapters V and VI. For typical man-made iron or steel objects, the magnetic moment, M, is between 10^5 and 10^6 cgs units per ton (either 1000 kg or 2000 lbs.), where

$$T = \frac{M}{r^3}\left(\text{for latitudes greater than } 60^\circ\text{, use } T = \frac{2M}{r^3}\right) \text{and}$$

T is the anomaly in gauss, M is the dipole moment in cgs and r the distance in centimeters. Thus the maximum anomaly for 0.1 ton of iron at a distance of 1000 centimeters would be between

$$T = \frac{10^5}{(10^3)^3} \times 0.1 = 10^{-5} \text{ gauss}$$

$$\text{and } T = \frac{10^6 \times 0.1}{(10^3)^3} = 10^{-4} \text{ gauss}$$

$$\text{or} \quad 1 \text{ gamma} < T < 10 \text{ gammas}$$

This same formulae for a magnetic anomaly can be expressed directly in terms of *gammas, pounds, and feet*, if desired, for

$$1.75 \times 10^2 < M_{fps} < 1.75 \times 10^3$$

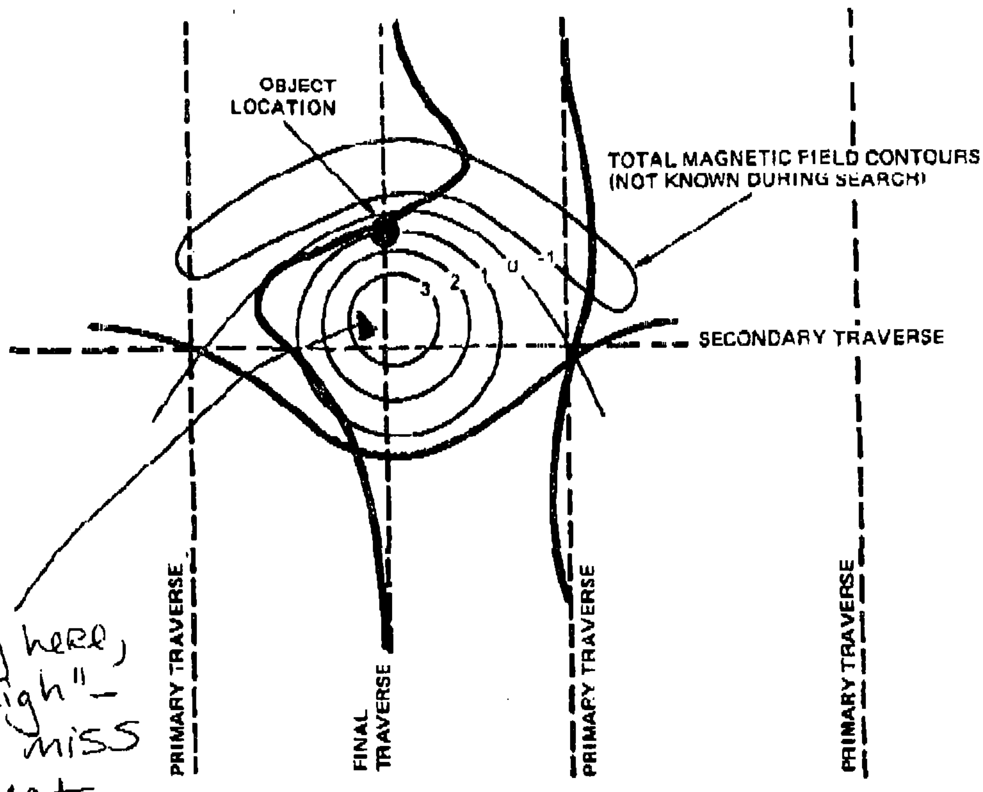
and

$$T - \frac{M_{fps}}{r^3}$$

where T is the anomaly in gammas, M the magnetic moment per pound of iron, and r the distance in feet *between the object and the magnetometer. A ton of iron* is therefore between 0.35 and 3.5 gammas at 100 feet or as a rule of thumb, can best be remembered as 1 ton of iron is 1 gamma at 100 feet. *Figure 46* is drawn as a nomogram or guide in estimating anomaly amplitude for a dipole comprised of common iron or steel.

Permanent vs. Induced Anomaly Sources

In general, iron objects exhibit both permanent and induced magnetization which have a net magnetization producing a single magnetic anomaly in the earth's field as *measured by the magnetometer. All rules herein*



If we dig here, at the "high" – we would miss the object.

Figure 45. Typical Sequence of Traverses During Search Procedures

o Enhancement or removal of surface targets, or deeper targets as required.

Data can be interpreted quantitatively to provide anomaly locations along a profile line or burial areas on a map. Semi-quantitative data for depth and mass (number of drums) can be obtained by the use of a model (see Figure 100) and calibrated instruments. However, error factors of 2 to 10 may occur in such calculations.

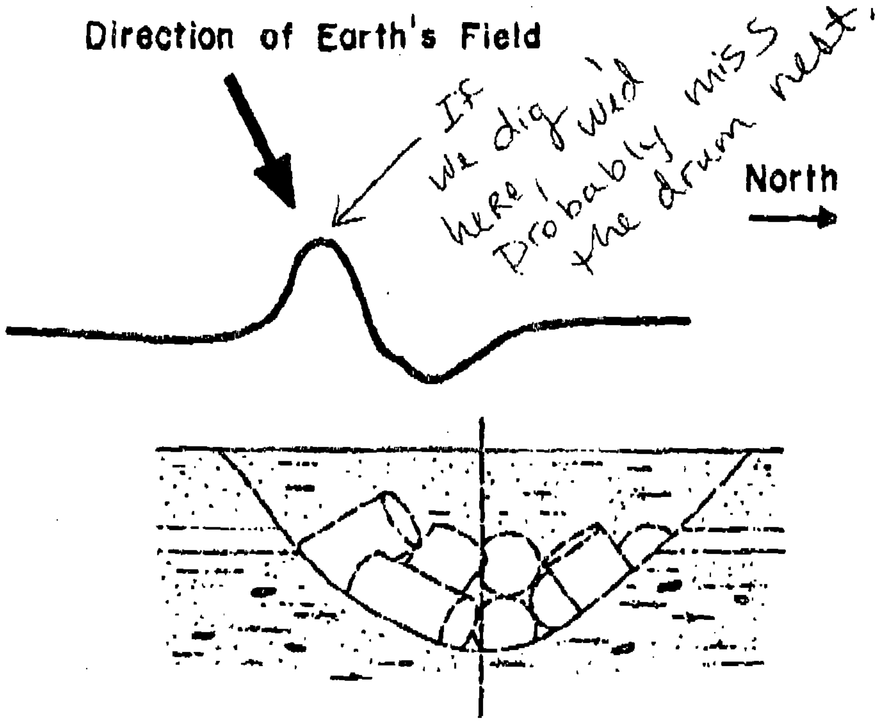


Figure 102. Diagram of magnetic anomaly over burial trench. Note that the peak anomaly may not necessarily lie over the center of the trench due to the angle of the earth's field.

Raw magnetic data, such as a strip chart record of a profile line, may be sufficient for final presentation (Figure 103) Simple maps may be drawn to show the concentrations of suspected buried drums (Figure 104). If high resolution data is available, a map can be contoured to provide more detailed information. A graphic presentation may be made by compiling parallel profile lines into a three-dimensional image of the magnetic data (Figure 105).

without consideration of the other last two factors, it is possible to appreciate the basis for:

- a negative anomaly over sources at the magnetic equator,
- absence of anomalies in the central portion of elongate N-S anomalies at the equator,
- both positive and negative fields for almost any anomaly,
- changes in anomaly character for different directions of the dipole,
- asymmetry of anomalies,
- monopole which has only positive sense yet for most inclinations still produces a total intensity anomaly with both positive and negative portions.

The simple exercise of drawing such anomalies may also elucidate other characteristics of signatures, which to many not familiar with magnetics or such behavior as shown here, appear to be complex and difficult to comprehend.

Based upon the above procedures, applied qualitatively, and upon the manner in which lines of flux are induced in various configurations of geologic bodies and ambient field directions and inclinations, it is possible to derive the various signatures shown in *Figure 26* (drawn freehand). By varying the effect of depth as it produces an anomaly of longer wavelength, and by building composite anomalies such as summing the effect of 2 faults to create a single wide, shallow dike, it is also possible to generate a composite curve demonstrating the effect of different sources and different depths which is the typical observation.

Contour Presentation of Dipole and Prism Anomalies

Profiles of total intensity are usually the only form of presentation from ground measurements even when data are taken on a 2-dimensional array. If measurements are taken properly, however, it is possible to construct a contour map by the methods described in Chapter IV. It is therefore useful to examine a few special cases of contour maps that would be expected over simple sources such as a dipole and a wide, vertical prism in various latitudes. Such a contour map also allows one to extract, even by simple inspection, how a given profile would appear at various positions over such simple-shaped forms which is useful information both in search and in